

TITAN BUILDING PRODUCTS TEST REPORT

SCOPE OF WORK

TESTING OF TITAN PRESSURE TREATED WOODEN GUARD WITH ALUMINUM PICKETS TO ASSESS RESISTANCE TO LOADS ON GUARDS AS PRESCRIBED IN THE 2015 NATIONAL BUILDING CODE OF CANADA (NBC) AND 2012 ONTARIO BUILDING CODE (OBC).

REPORT NUMBER

103645361TOR-003

TEST DATE(S)

11/20/18 TO 11/21/18

ISSUE DATE

01/07/19

[REVISED DATE]

01/07/19

RECORD RETENTION END DATE

11/28/23

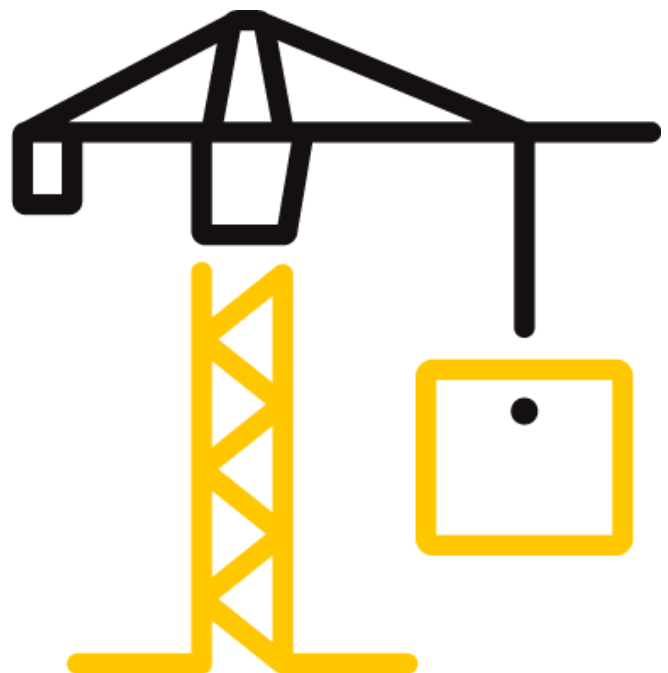
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TEST REPORT FOR TITAN BUILDING PRODUCTS

Report No.: 103645361TOR-003

Date: 01/07/19

REPORT ISSUED TO

TITAN BUILDING PRODUCTS

5450 Canotek Rd Unit 71

Ottawa, ON K1J9G6

Canada

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Titan Building Products to conduct Loads on Guards testing on their pressure treated wooden guard with aluminum pickets. The scope of the testing was to assess the ability of the guard system to resist the Specified and Factored Loads for guards within dwelling units and exterior guards serving not more than 2 dwelling units as prescribed in Table 9.8.8.2 of the following codes:

- 2015 National Building Code of Canada (NBC)
- 2012 Ontario Building Code(OBC)


Testing was conducted at Intertek test facility in Mississauga, ON, on November 20th, 2018 to November 22nd, 2018


SECTION 2

SUMMARY OF TEST RESULTS

The Titan pressure treated SPF wooden guard with aluminum pickets as identified and evaluated in this report has demonstrated resistance to the Specified and Factored Loads for guards within dwelling units and exterior guards serving not more than 2 dwelling units as prescribed in Table 9.8.8.2 of the 2015 National Building Code of Canada (NBC) and 2012 Ontario Building Code (OBC)

For INTERTEK B&C:

COMPLETED BY:	Tyrone Williams
TITLE:	Technician Building Products
SIGNATURE:	
DATE:	01/07/19

REVIEWED BY:	Joe DeRose, P. Eng.
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SECTION 3

TEST METHOD(S)

The samples were evaluated in accordance with the following:

- 2015 National Building Code of Canada (NBC) , *Table 9.8.8.2, item 1*
- 2012 Ontario Building Code (OBC) , *Table 9.8.8.2, item 1*

SECTION 4

EQUIPMENT

Calibration of test equipment was performed by Intertek B&C in accordance with ISO 17025 requirements.

Table 1 - Equipment Calibration

Instrument/Equipment	Asset #	Calibration Due Date
2K Load Cell with Digital Indicator	280-01-0774	Oct-31-2019
Stop Watch	273-01-1201	Aug-23-2019
600mm Scale	280-01-1234	Mar-26-2019
Tape Measure	280-01-1253	Nov-5-2019
Digimatic Indicator	280-01-0836	Mar-26-2019
Powerfist 24" stroke Hydraulic Ram	N/A	N/A
Electric Hydraulic Pump	N/A	N/A

SECTION 5

TEST SAMPLE

5.1 SAMPLE SELECTION

One assembled guard system was submitted to Intertek directly from the client. Samples were not independently selected for testing and were received at the Evaluation Center on November 16th, 2018.

5.2 SAMPLE DESCRIPTION AND ASSEMBLY

The three-bay test assembly consisted of two (2) nominal 6x6 end posts and two (2) nominal 4x4 intermediate posts fitted with "post anchor 6x6" and "post anchor 4x4" respectively. The nominal 2x4 pressure treated wood top and bottom rails were fitted vertically between posts. A plastic shadow rail-female horizontal connector was fitted to each end of the rails using two (2) #10 x 2 in. flat head wood screws. The rails were subsequently fastened to the shadow rail-male horizontal connectors which were screwed to the posts using two (2) #10 x 2 in. flat head wood screws.

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A semi-continuous nominal 2x6 wood rail-cap was fitted between end posts, creating a "T-shaped" top rail. The two(2) pieces of nominal 2x6 wood rail cap measured 3560 mm and 1760 mm in length, and were screwed to the top of the 2x4 using #10 x 3-1/4 in. flat head wood screws spaced approximately 380 mm on center. The ends of the rail cap were butted and toenailed into the nominal 6 x 6 post using three (3)-#10 x 3-1/4 in. flat head wood screws.

Fitted between the top and bottom rails were hollow round aluminium pickets measuring 785 mm long x 19 mm dia. x 1.42 mm thick walls. Pickets were held in place via plastic connectors with covers. The connectors were screwed to the rails using one (1) #9 x 1-3/4 in. pan head screw.

As installed, the posts were spaced 1829 mm on centre; six (6) - #14 x 4 in. flat head wood screws were used to anchor the posts to a wood substrate. The wood substrate consisted of a layer of 5/4 in. thick cedar deck board and two (2) layers of 2 in. x 12 in. SPF wood. The height of the guard measured 1067 mm from the surface of the cedar deck board to the top of the 2x6 wooden rail.

Guard Assembly Components							
Drawing Title/ Part No.	QTY	Part Description	Part Dimensions (mm)				Reported Material
			Width	Height	length	Nominal Thickness	
No Drawing	2	Nominal 6x6 wood posts	137	137	1087	-	Pressure Treated SPF wood
No Drawing	2	Nominal 4x4 wood posts	87	87	1015	-	Pressure Treated SPF wood
No Drawing	6	Nominal 2x4 wood used for bottom rails and part of top rail.	87	38	1702	-	Pressure Treated SPF wood
No Drawing	2	Nominal 2x6 wood used for top rail cap	138 138	38 38	3560 1760	-	Pressure Treated SPF wood
No Drawing	42	Picket infill	Dia.= 19		785	1.42	Aluminium
TIPR4402/ TIPR4402-Base	2	4x4 post anchor installed into 4x4 post using four(4)- 3/8 in. x 5 in. lag screw	See Drawing				Hot Dip Zinc Steel
TIPR6602/ TIPR6602-Base	2	6x6 post anchor installed into 6x6 post using six(6)- 1/2 in. x 5 in. lag screw, with three(3) screws oriented normal to the inward and three(3) screws oriented normal to the outward load of the guard system.	See Drawing				Hot Dip Zinc Steel
shadow rail- horizontal female	12	female plastic mount connector	37	14	84	-	Polycarbonate
shadow rail-Male horizontal connector	12	Male plastic mount connector	37	-	87	-	Polycarbonate
Round Connector	84	Round Connector	See Drawing				Polycarbonate
Connector cover	84	Decorative cover for picket and round connector.	See Drawing				Polycarbonate

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SECTION 6**TESTING AND EVALUATION****6.1 SAMPLE PREPARATION**

The test guards were received assembled and no sample preparation was required. The guards were tested as received.

6.2 CONDITIONING

Samples were tested in the laboratory under ambient conditions. No specific conditioning parameters were required before testing.

6.3 PROCEDURE**6.3.1 Infill Load Test**

Test Loads were applied over a 300 mm x 300 mm square platen normal to the infill at the intersection of the horizontal and vertical side edge of the infill. Specified and factored loads were applied and held for one (1) minute, whereupon deflection of the infill at the point of maximum deflection was recorded. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

6.3.2 Uniform Load Test

The top rail was subjected to vertical quarter point loads applied by means of a load distributing bar. Specified and factored loads were applied and held for one (1) minute, whereupon deflection of the top rail at mid-span was recorded. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

6.3.3 Concentrated Load Test

Concentrated test loads were applied separately and sequentially at the following three critical locations: *vertically on the top rail at mid-span between posts, horizontally on the top rail adjacent to a post, and horizontally on top of a single post*. Specified and factored loads were applied over a 100 mm x 100 mm square platen and held for one (1) minute, whereupon deflection was recorded at the point of application of the load. The load applied on the rail adjacent to the post was applied to the opposite post from which the top-of-post-test was performed on. After release of the load, the system was evaluated for failure, evidence of disengagement and visible cracks in any component.

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6.3.1 Factored loads

The applicable factored loads to be applied were based on the specified loads in Table 9.8.8.2 of the 2015 National Building Code of Canada (NBC) and 2012 Ontario Building Code (OBC) increased by the following safety factors as applicable:

- Specified loads multiplied by $1.5/\phi/K_T$, where $\phi=0.9$ resistance factor for wood failure and $K_T=0.85$ Treatment factor, the resulting safety factor was **1.96**
- Specified loads multiplied by $1.5/\phi/K_T$, where $\phi=0.6$ resistance for wood screw connection and $K_T=0.85$ Treatment factor, the resulting safety factor was **2.94**

SECTION 7

TEST RESULTS

Direction of Load	Test		Specified loads kN(lbf)	Deflection at Specified load mm (in)	Safety Factor	Required Factored Load kN (lbf)	Results/observation
Symmetrical Guard. Load applied in one direction	Horizontal load applied on elements within the guard. Load applied over a 300 mm x 300 mm area.		0.5 (112)	20.2 (0.79)	2.94	1.47 (330)	Pass
	Evenly distributed vertical load applied as quarter point equivalent load at the top of the guard (mid span)		1.5 kN/m (103-lbf/ft)	3.73 (0.14)	1.96	2.94kN/m (202-lbf/ft)	Pass <i>Tested to Safety Factor of 2.5 without any failure</i>
	Horizontal concentrated load applied at the minimum required height of the guard	Top Rail (mid Span)	1.0 (225)	27 (1.06)	1.96	1.96 (440)	Pass <i>Tested to Safety Factor of 2.5 without any failure</i>
		Top Rail at 4x4 post	1.0 (225)	50.1 (1.97)	2.94	2.94 (661)	Pass
		Top Rail Splice at 4x4 post	1.0 (225)	64.1 (2.52)	2.94	2.94 (661)	Pass Evidence of damage to plastic rail connectors at factored load
		Adjacent to end Post	1.0 (225)	27.8 (1.09)	2.94	2.94 (661)	Pass
		Top of end Post	1.0 (225)	38.1 (1.50)	2.94	2.94 (661)	Pass

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SECTION 8

CONCLUSION

Intertek Testing Services NA Ltd. (Intertek) has conducted testing on the Titan pressure treated SPF wooden guard with aluminum pickets. The scope of the testing was to assess the ability of the guard system to resist the Specified and Factored Loads on Guards within dwelling units and exterior guards serving not more than 2 dwelling units as prescribed in Table 9.8.8.2 of the following codes:

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- 2012 Ontario Building Code(OBC)

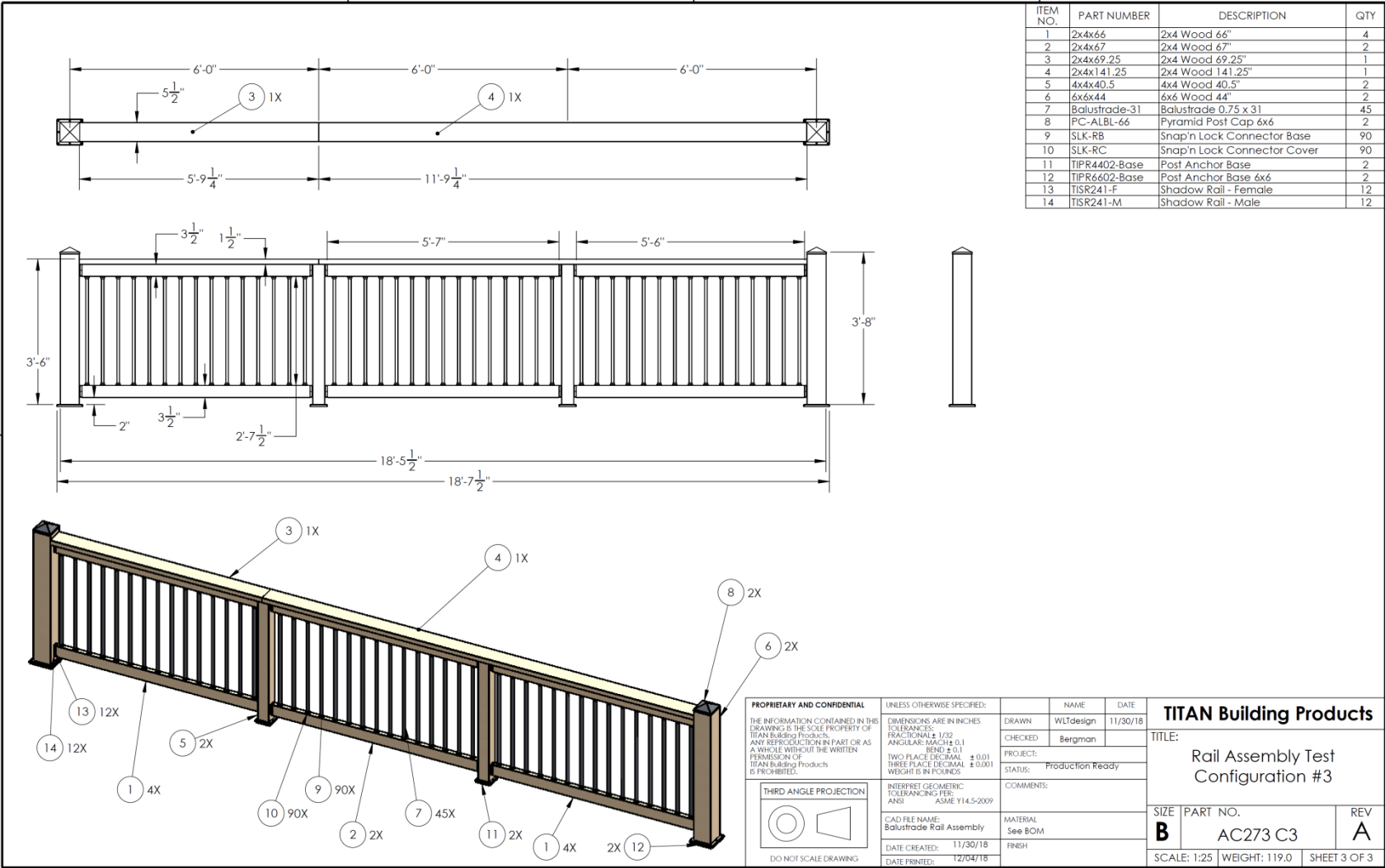
The Titan pressure treated SPF wooden guard with aluminum pickets as identified and evaluated in this report has demonstrated resistance to the Specified and Factored Loads for guards within dwelling units and exterior guards serving not more than 2 dwelling units as prescribed in Table 9.8.8.2 of the 2015 National Building Code of Canada (NBC) and 2012 Ontario Building Code (OBC)

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

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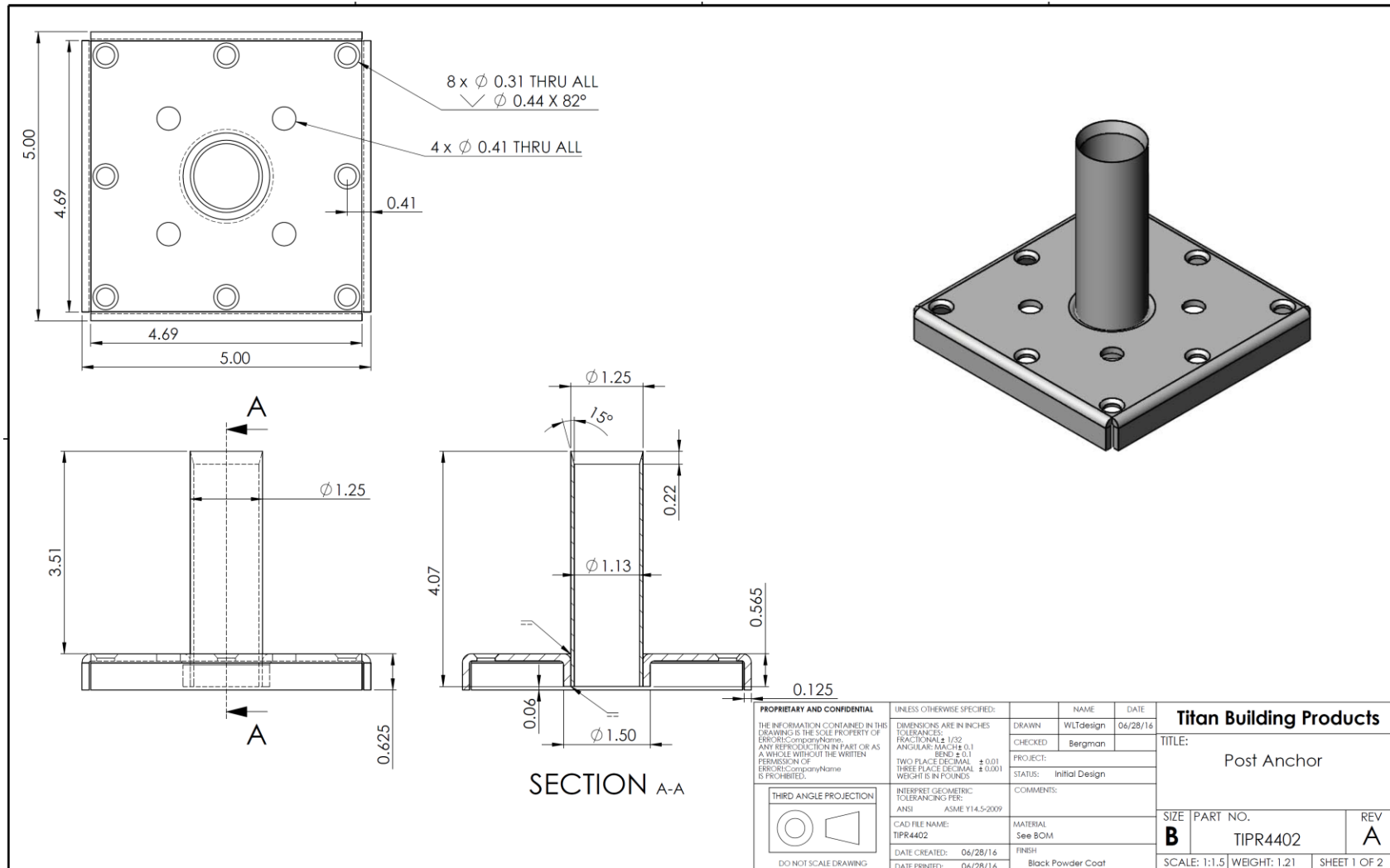
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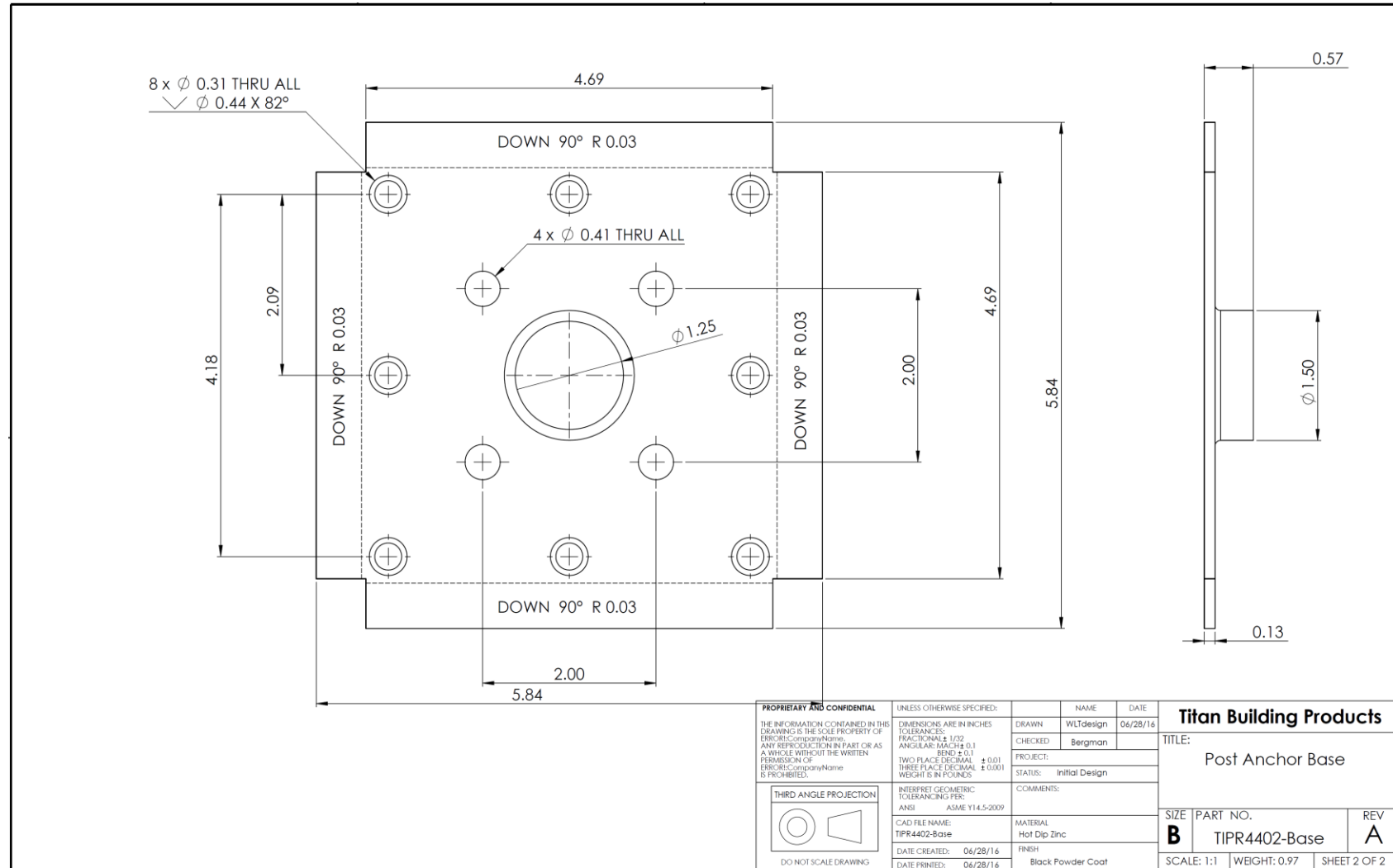
APPENDIX -DRAWINGS



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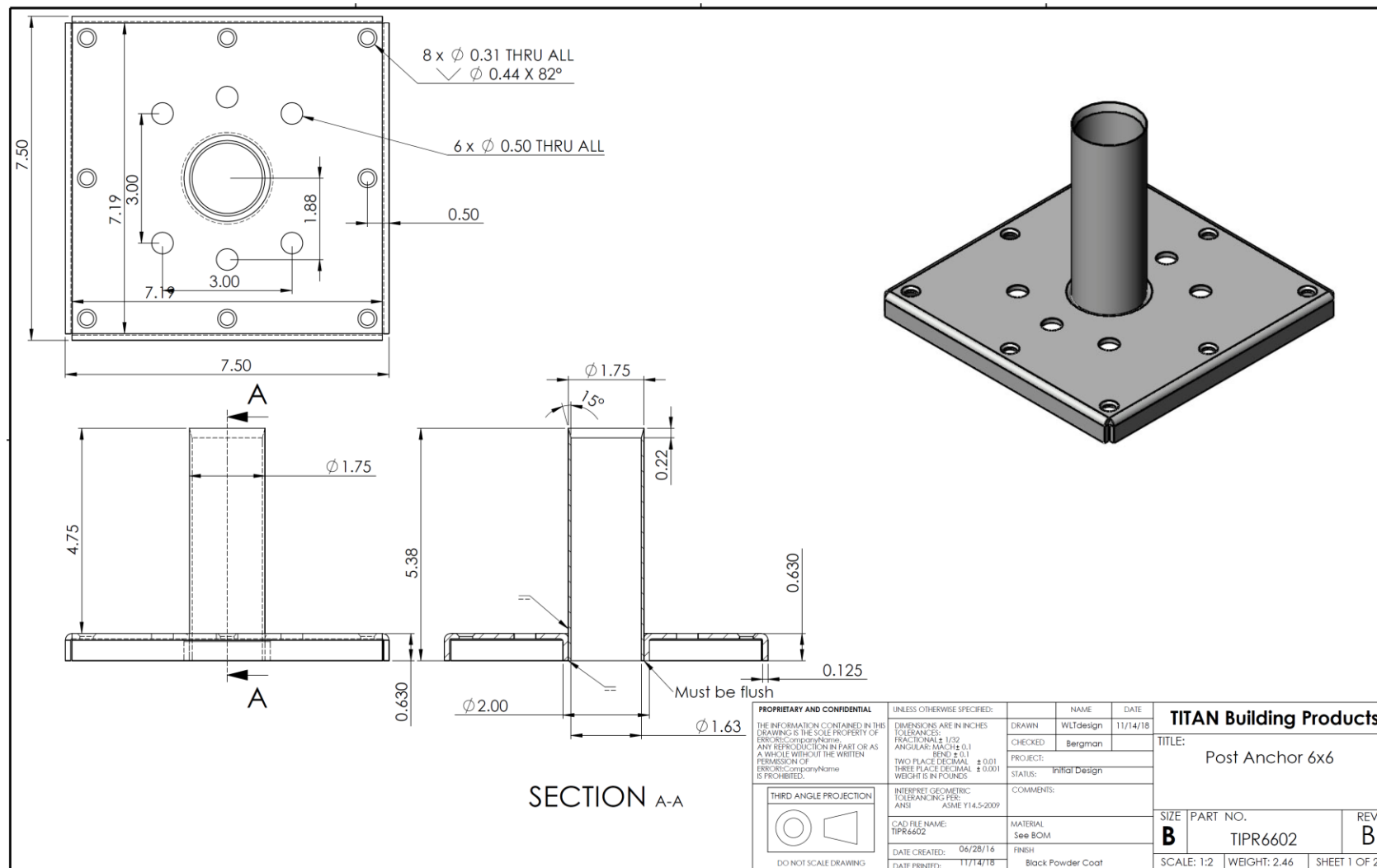
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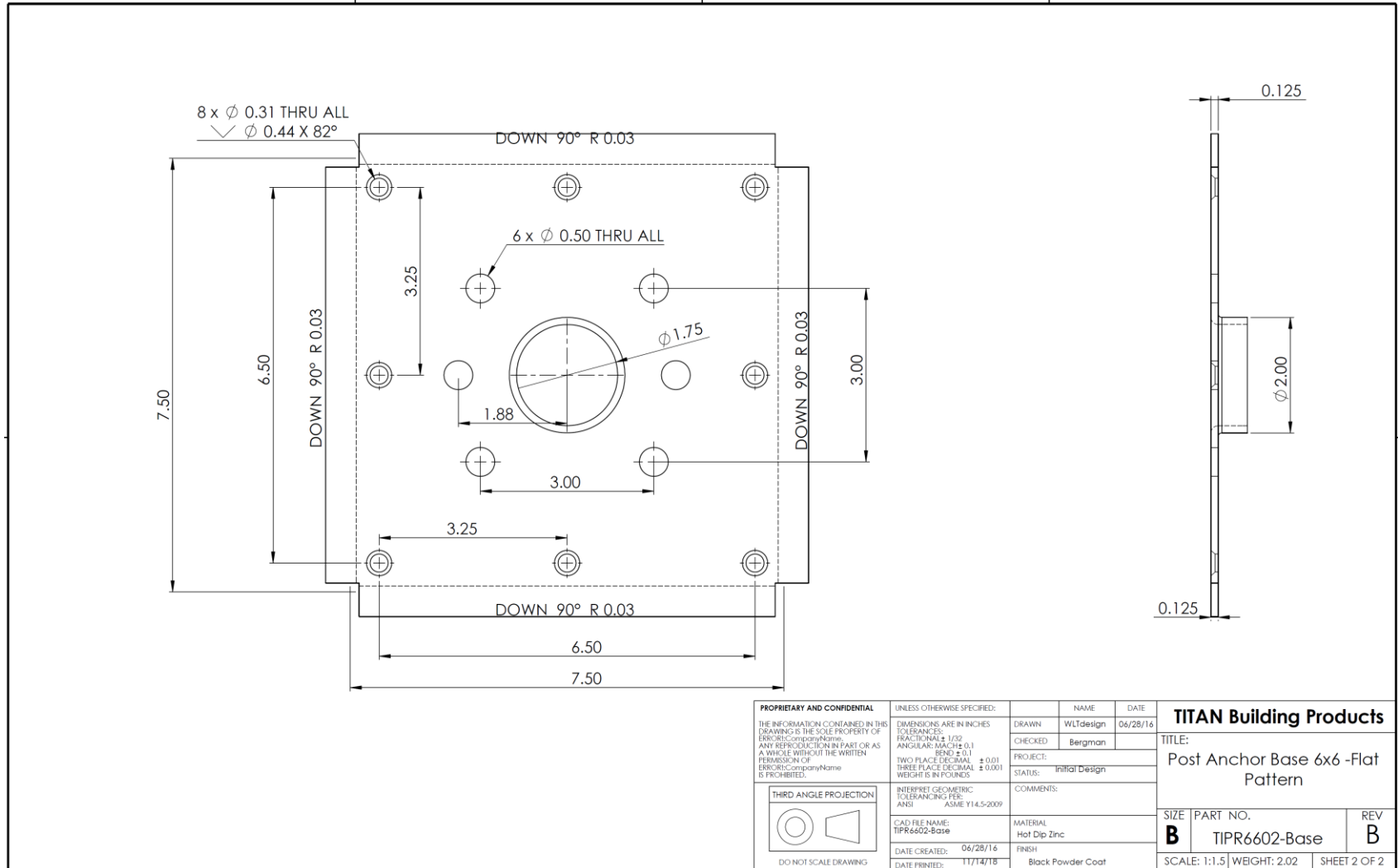
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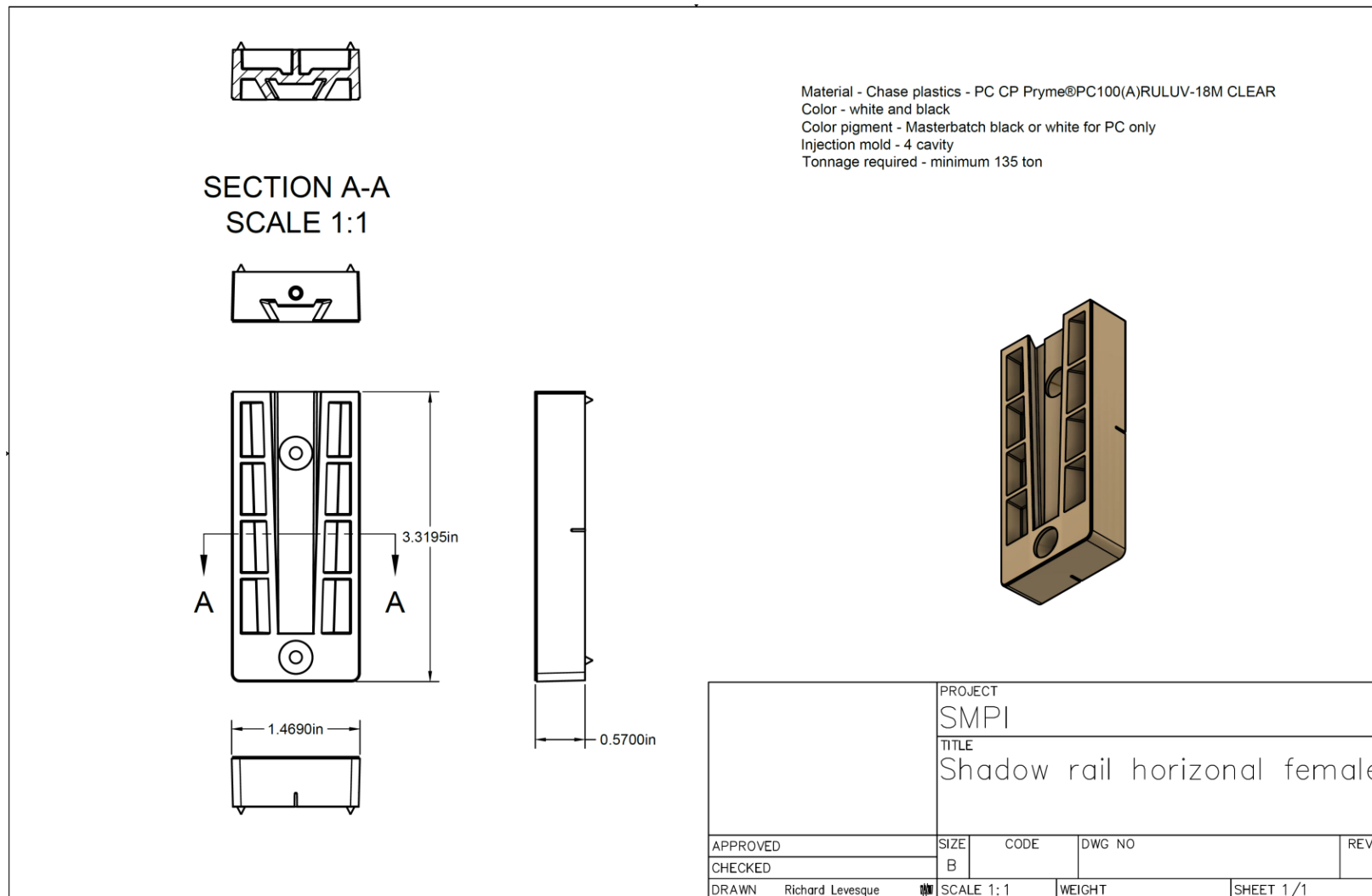
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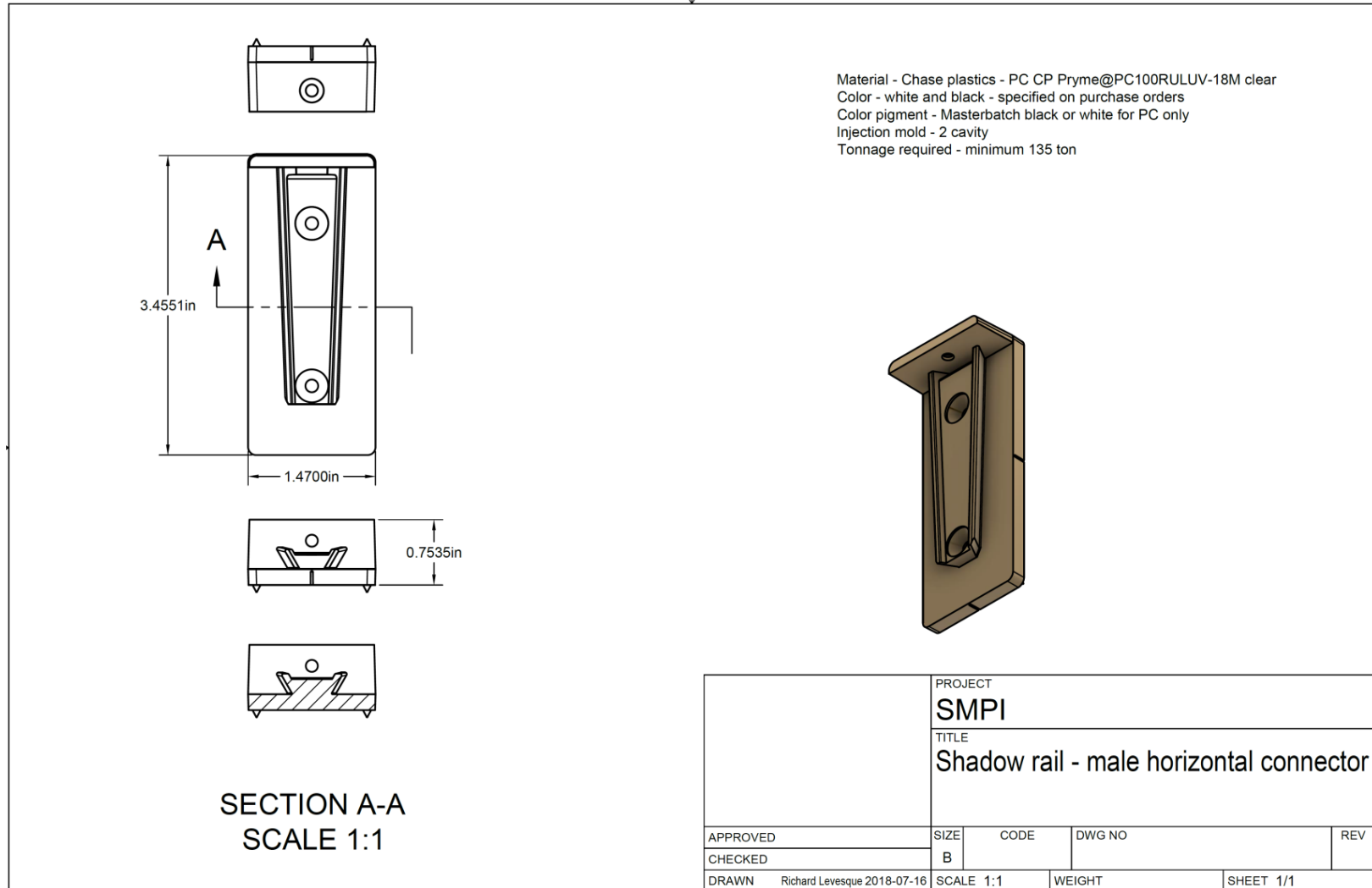
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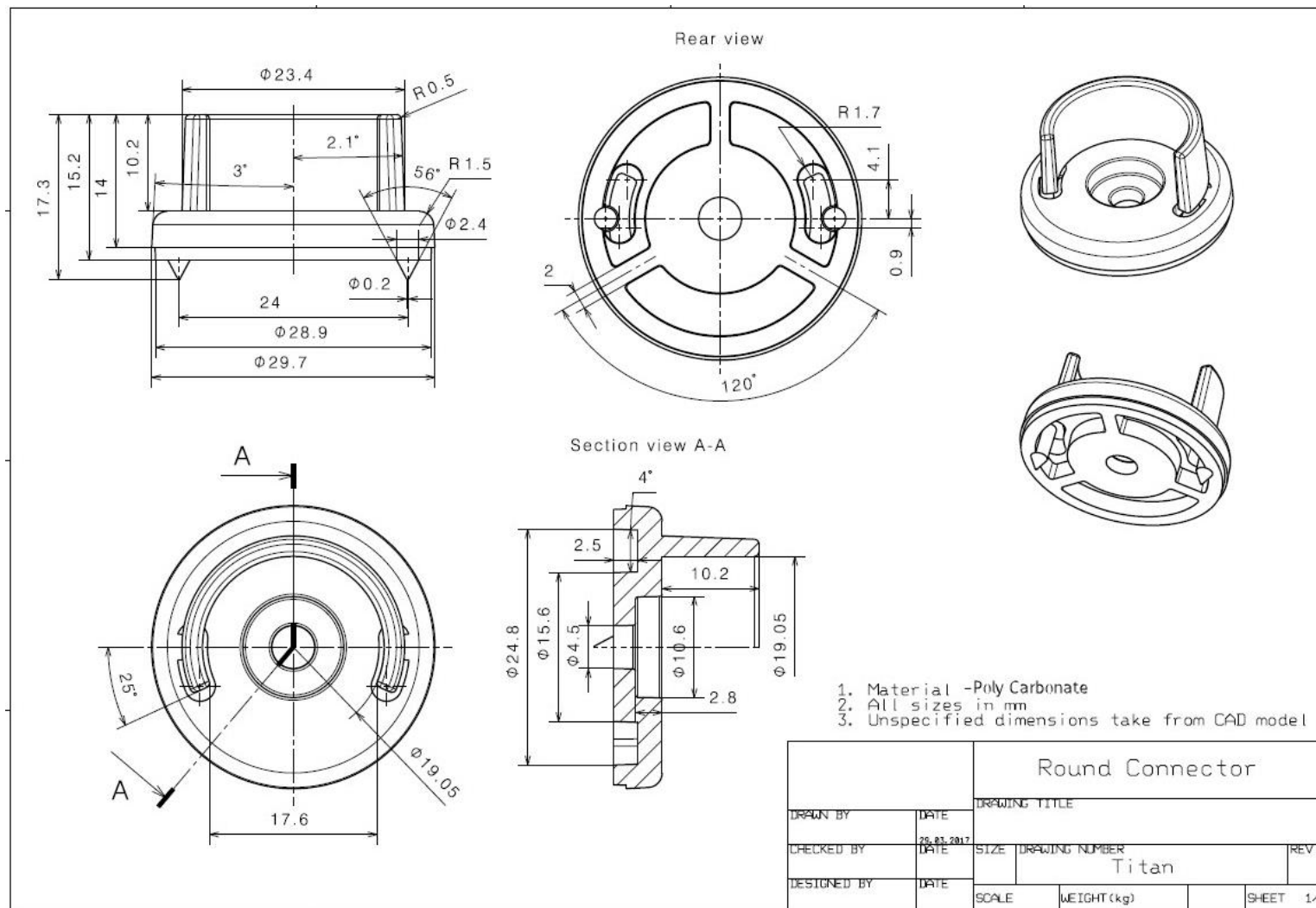
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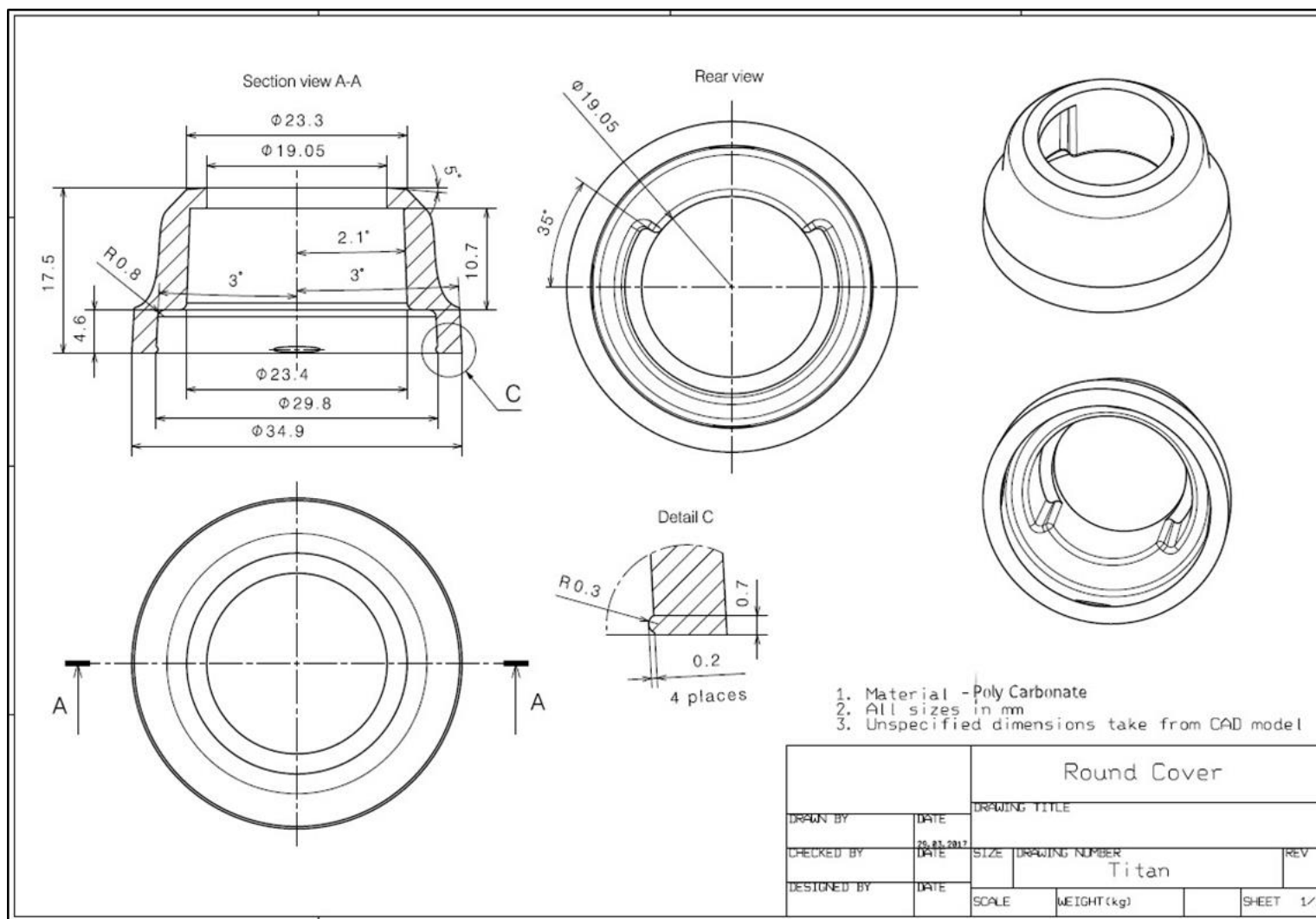
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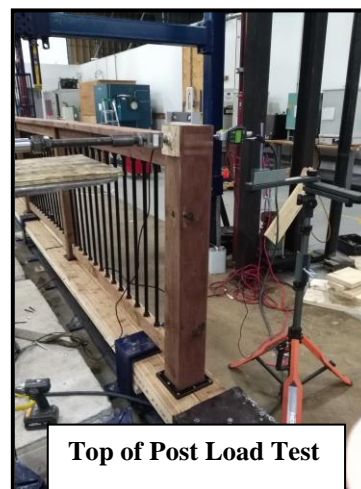
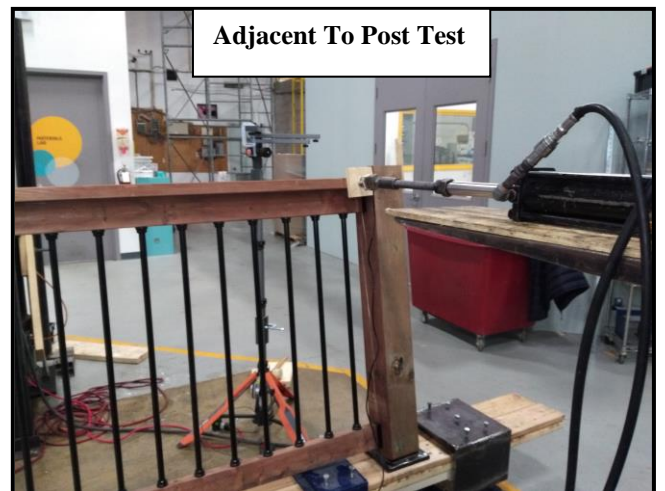
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SECTION 10

PICTURES



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SECTION 11

REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	01/07/19	0	Original Report Issue
1	1/7/19	4,8,14,15	Reported material for round cover and round connector updated to polycarbonate. Guard assembly drawing added to report.

July 9, 2014

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This letter serves as a response to a request for clarification of the minimum specified loads listed in Article 9.8.8.2 of the 2012 Ontario Building Code.

Intertek has conducted load testing for Titan Building Products on the following:

- Primus 4x4 post anchors anchored to a wood substrate
- Primus 4x4 post anchors (with Chicago Bolt) anchored to a wood substrate
- Primus 6x6 post anchors anchored to a wood substrate

In addition to load testing on the posts, a guardrail system incorporating the posts was also constructed and tested. Details of the post load testing, guardrail construction, test method and test results can be found in the following Intertek Reports:

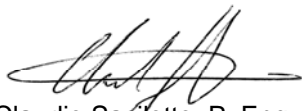
- 100390597TOR-003a, dated January 30, 2012
- 100390597TOR-003b, dated February 29, 2012
- 100390597TOR-003c, dated February 29, 2012
- 100604363TOR-004b, dated March 27, 2012
- 100604363TOR-004c, dated March 27, 2012

The test loads applied were as set forth in the following:

- 2006 Ontario Building Code Article 9.8.8.2, Sentence 1 in conjunction with Table 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.
- 2010 National Building Code of Canada, Article 9.8.8.2, Sentence 1 in conjunction with Table 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.

On January 1, 2014, the 2012 Ontario Building Code came into effect. Upon review of the 2012 Ontario Building Code it was determined that there were no changes to the minimum specified loads in Article 9.8.8.2, specifically Sentence 1 in conjunction with Table 9.8.8.2 for guards within dwelling units and for exterior guards serving not more than 2 dwelling units.

Please let us know if you have any questions.



Claudio Sacilotto, P. Eng
Senior Project Engineer